Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Canceled)

2. (Previously Presented) The process according to claim 17, wherein said DNA comprises at least one thiophosphate nucleotide.

3. (Currently Amended) A process for fragmenting and labeling at least one synthetic ~~or natural~~ DNA, RNA or chimeric DNA-RNA polymer, comprising the steps of:

chemically fragmenting said member in the presence of at least one multivalent metal cation in an aqueous solution, to produce a plurality of DNA or RNA fragments having freed terminal phosphates for further reaction; and

attaching a labeling agent on a plurality of said fragments at freed terminal phosphates located at the 3' end and/or 5' end of said fragments, wherein the fragmenting and attaching steps take place in an *in vitro* nucleic acid amplification mixture.

4. (Canceled)

5. (Previously Presented) The process according to claim 18, wherein the treating step comprises adding a quencher to the aqueous solution after the fragmenting and attaching steps.

6. (Original) The process according to claim 5, wherein the quencher is a pyrophosphate, thiol derivative, chelating agent, phosphate anion or carbonate anion.

7. (Previously Presented) The process according to claim 18, wherein the treating step physically separates the labeled nucleic acid fragment from unattached labeling agent in the aqueous solution after the fragmenting and attaching steps.

8. (Previously Presented) The process according to claim 18, wherein the treating step further includes adding an acid to the mixture after the fragmenting and attaching steps.

9. (Previously Presented) A process for fragmenting and labeling a synthetic or natural DNA or RNA nucleic acid, comprising the steps of:

chemically fragmenting said nucleic acid in the presence of at least one multivalent metal cation in an aqueous solution, to produce a plurality of DNA or RNA fragments having freed terminal phosphates for further reaction;

attaching a labeling agent on a plurality of said fragments at freed terminal phosphates located at the 3' end and/or 5' end of said fragments; and

treating said aqueous solution to decrease or eliminate unattached labeling agent, wherein the treating step physically separates the labeled nucleic acid fragment from unattached labeling agent in the aqueous solution after the fragmenting and attaching steps, and wherein the treating step further includes adding a chelating agent to the mixture after the fragmenting and attaching steps.

10. (Previously Presented) The process according to claim 18, wherein the treating step uses an organic solvent to separate the labeled nucleic acid fragment from the unattached labeling agent.

11. (Original) The process according to claim 10, wherein the organic solvent is 1-butanol, 2-butanol, isopentyl alcohol, 1-pentanol or cyclohexanol.

12. (Previously Presented) The process according to claim 18, wherein the treating step separates the labeled nucleic acid fragment from the unattached labeling agent by using solid phase extraction of the nucleic acid fragments on a solid support.

13. (Original) The process according to claim 12, wherein said solid support is beads, gels, ion exchange resin, reverse phase resin, silica matrix or a membrane.

14. (Original) The process according to claim 12, wherein the labeled nucleic acid fragment is eluted from the solid support by using a buffer containing betaine.

15. (Previously Presented) The process according to claim 18, wherein the treating step precipitates the labeled nucleic acid fragment at ambient temperature from a solution that contains betaine, dodecyl trimethylammonium bromide (DTAB) and unlabeled nucleic acid.

16. (Previously Presented) A process for fragmenting and labeling a synthetic or natural DNA or RNA nucleic acid, comprising the steps of:

chemically fragmenting said nucleic acid in the presence of at least one multivalent metal cation in an aqueous solution, to produce a plurality of DNA or RNA fragments having freed terminal phosphates for further reaction;

attaching a labeling agent on a plurality of said fragments at freed terminal phosphates located at the 3' end and/or 5' end of said fragments; and

treating said aqueous solution to decrease or eliminate unattached labeling agent, wherein the treating step physically separates the labeled nucleic acid fragment from unattached labeling agent in the aqueous solution after the fragmenting and attaching steps, and wherein the treating step dilutes an *in vitro* nucleic acid amplification mixture.

17. (Previously Presented) A process for fragmenting and labeling at least one synthetic or natural member selected from the group consisting of DNA and chimeric DNA-RNA polymers, comprising the steps of:

chemically fragmenting said member in the presence of at least one multivalent metal cation in an aqueous solution, to produce a plurality of DNA or RNA fragments having freed terminal phosphates for further reaction; and

attaching a labeling agent on a plurality of said fragments at freed terminal phosphates located at the 3' end and/or 5' end of said fragments, wherein the fragmenting and attaching steps are performed in a single reaction mixture.

18. (Previously Presented) A process for fragmenting and labeling a synthetic or natural DNA or RNA nucleic acid, comprising the steps of:

chemically fragmenting said nucleic acid in the presence of at least one multivalent metal cation in an aqueous solution, to produce a plurality of DNA or RNA fragments having freed terminal phosphates for further reaction;

attaching a labeling agent on a plurality of said fragments at freed terminal phosphates located at the 3' end and/or 5' end of said fragments; and

treating said aqueous solution to decrease or eliminate unattached labeling agent, wherein the fragmenting and attaching steps are performed in a single reaction mixture.

19. (Previously Presented) The process according to claim 17, wherein the fragmenting and attaching steps are effected in separate steps.

20. (Previously Presented) The process according to claim 18, wherein the fragmenting and attaching steps are effected in separate steps.

21. (Previously Presented) The processing according to claim 18, wherein the nucleic acid is a chimeric DNA-RNA polymer, DNA comprising at least one thiophosphate nucleotide or RNA comprising at least one thiophosphate nucleotide.

22. (Previously Presented) The process according to claim 18, wherein the attaching step attaches a label to an internal or terminal thiophosphate or to an internal or terminal phosphate of said fragment.

23. (Previously Presented) The process according to claim 18, wherein the fragmenting step further includes use of a chemical catalyst.

24. (Original) The process according to claim 23, wherein the chemical catalyst is a base selected from the group consisting of imidazole, a substituted analogue of imidazole, and a compound that includes an imidazole ring or substituted analogue of an imidazole ring.

25. (Previously Presented) The process according to claim 23, wherein the chemical catalyst is selected from the group consisting of N-methylimidazole, 3-(N-morpholino) propane sulfonic acid (MOPS), N-2-hydroxyethylpiperazine-N'-2-ethanesulfonic acid (HEPES), piperazine-N,N'-bis (2-ethane sulfonic acid) (PIPES), and bioorganic polyamines.

26. (Canceled)

27. (Previously Presented) The process according to claim 17, wherein the DNA, or chimeric DNA-RNA polymer is DNA comprising at least one thiophosphate nucleotide or RNA comprising at least one thiophosphate nucleotide.

28. (Previously Presented) The process according to claim 18, wherein the nucleic acid is an RNA or RNA comprising at least one thiophosphate nucleotide, and the multivalent metal cation is Sr^{2+}, Ba^{2+}, Pb^{2+}, Cd^{2+}, Fe^{2+}, Ni^{2+}, Ru^{3+}, Ce^{3+}, Eu^{3+}, Tb^{3+}, Tm^{3+}, Yb^{3+} or Lu^{3+}, and the fragmenting step further includes use of a chemical catalyst.

29. (Previously Presented) The process according to claim 18, wherein the nucleic acid is a DNA and the multivalent metal cation is Tb^{3+}, and the fragmenting step further includes use of a chemical catalyst.

30. (Previously Presented) The process according to claim 18, wherein the nucleic acid is RNA or RNA comprising at least one thiophosphate nucleotide, and the multivalent metal cation is Cr^{3+}, Ce^{3+}, Yb^{3+}, Tb^{3+}, Eu^{2+} or Pb^{2+}.

31. (Previously Presented) The process according to claim 18, wherein the nucleic acid is DNA or DNA comprising at least one thiophosphate nucleotide, and the multivalent metal cation is Be^{2+}, Cr^{3+}, Pb^{2+}, In^{3+}, Tb^{3+}, Ce^{3+}, Yb^{3+} or Ni^{2+}.

32. (Previously Presented) The process according to claim 18, wherein the multivalent metal cation is Tb^{3+} or Ce^{3+}.

33. (Original) The process according to claim 17, wherein the mixture contains the labeling agent in a concentration of between 0.1 mM to 4 mM.

34. (Original) The process according to claim 33, wherein the mixture contains the labeling agent in a concentration of between 0.1 mM to 1 mM.

35. (Original) The process according to claim 33, wherein the labeling agent concentration is between 0.3 mM to 0.55 mM.

36. (Original) The process according to claim 17, wherein the labeling agent contains alkyl halide or haloacetamide reactive functions.

37. (Previously Presented) The process according to claim 18, wherein the labeling agent is 5-(bromomethyl)fluorescein, 6-(bromomethyl)fluorescein, 6-iodoacetamidofluorescein or 5-iodoacetamidofluorescein.

38. (Previously Presented) The process according to claim 17, wherein the synthetic or natural member is DNA polymer.

39. (Previously Presented) The process according to claim 18, wherein the synthetic or natural nucleic acid is DNA.